The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

BOUVERIE HOUSE, 154 FLEET STREET, LONDON, E.C.4

Telegrams: ALLANGAS FLEET LONDON
Telephone: CENTRAL 3212 (10 lines)
GLASGOW: 116, Hope Street (Central 3970)
BIRMINGHAM: Daimler House, Paradise Street (Midland 0784-5)
THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

VOL. XLV. No. 1159 September 13, 1941 Annual Subscription, 21s. Overseas, 26s.

New Orders

"METHOD," said Dean Swift, "is good in all things. Order governs the world." Order, organisation, planning, have long been the characteristics of the Teutonic mind. That those estimable qualities have not led to the supreme heights of success is not due to anything inherently wrong in them. It is due to a compensating weakness in the German make-up. To take a typically English analogy, the German resembles a batsman who has carefully mastered the technique of his art and plays each stroke in copy-book style. But against good-length bowling his patience becomes exhausted and he is betrayed into making a violent "cow-shot" in the hopes of finding a short cut to rapid scoring; from this he is inevitably caught out. The political analogy of the "cow-shot" is war, through which world domination is sought as a rapid means of achieving that commercial and industrial domination which is regarded as the Valhalla of the *Herrenvolk*. But it is important to recognise that it is not the technique of method and of organisation that is at fault; it is the impatience leading to attempted short cuts.

Thus it was that when a well-known chemical engineer remarked the other day that this country required after the war a new industrial order, we were disposed to admit some possibility that he might be right. The British are an individualistic race; they take unkindly to regimentation and discipline; the Dominions and Colonies are supremely individualistic. Any new order that may be imposed upon our industry must therefore be voluntary to the extent that the individualism of the race is allowed full scope, even though some measure of compulsion may be needed in certain directions. The need for co-operation in industry is already becoming recognised. Co-operation started with Trades Unions and Employers' Associations and the co-operation that has since grown up between employers and employed should be further extended. The Germans—the Nazi Germans—have regimented their workers by compulsion induced by the Gestapo. We must choose the voluntary way of mutual interest.

Employers' Associations are increasing in scope and importance. Many industries are to some extent controlled by these bodies. Prices, production, and so forth are often dealt with co-operatively. Has not the time come to organise each industry into an entity? Every firm in every industry depends for its existence on certain factors which are partly or entirely controllable. The difference between cost price and selling price depends on manufacturing methods, and on competitive prices. Prices can be controlled, though only within limits. Excessive prices lead to the entry of alternative competitive products, or perhaps of foreign products, into the market. Thus manufacturing methods leading to high quality and low prices are also the concern of the whole industry.

Manufacturing methods have not hithero been regarded as coming within the purview of trade associations. We suggest that they should. It is to the advantage of all that the whole industry should be efficient. In that way the best reputation for quality can be achieved and the price levels reduced to a minimum. Offenders who do not keep to their dates of delivery are a nuisance in the home market and a menace in the export market. They could and should be dealt with through properly organised trade associations. New processes and new manufacturing techniques are evolved from time to time. It is to the advantage of an industry that they should become widely known and used by all in the industry as a contribution to general efficiency promoting general prosperity. Too often inventors and innovators find difficulty in getting a hearing; the trade association as here visualised would have machinery to enable this to be done. In the past individual concerns found their resources strained by the cost of research and development work and were sometimes unable to take advantage of new ideas owing to the cost of development. Others are unwilling to adopt anything new. All this must be changed if this country is to be efficient as an international competitor in trade.

In established industries it often happens that too many small firms undertake to make, at a multiplicity of factories, products that would be better made at a large central works. The day of the small concern is passing. The large concern is better able to bear development expenditure, to give attractive prospects to its employees, and to manufacture at low cost. Co-operative selling has been known in the chemical industry—notably in the tar and fertiliser sections—for many years. Where concentration of production is not possible, concentration of selling usually is and possesses outstanding advantages. Co-operative selling in the coal trade has proved its worth, and has greatly increased the power of the colliery interests—even though that power is not always used wisely.

These ideas will seem revolutionary to the average individualistic Briton, but in fact they are not. They are symptomatic of the passing of an age—the age of individualism that reached its heyday under Queen Victoria and has been wilting ever since. We have found it necessary to organise for war. We shall find it necessary to organise for peace. Exactly how this is to be done is open for debate—but it is time we were thinking about it.

CONTENTS

NOTES AND COMMENTS

Infra-Red Radiation in Paint Drying

AN interesting use of infra-red radiation for baking enamel has been applied by the Ford Motor Company during the last few years. The first use made of this was a light cave completely studded with lamps large enough to take an automobile body, the distance of the lamps from the car being some 12-18 in. This was used for drying priming paints. These paints were of the oleoresinous type, a combination of natural gum resin with linseed and tung oil containing the necessary colour. The paints could be dried by the infra-red radiation in one hour at 121° C. By the addition of small amounts of lead, manganese and cobalt the drying time of the priming coat was reduced to 7 minutes. Several forms of drying oven were investigated, but ultimately tunnels were used for the purpose. It does not appear that success has yet been achieved in drying the finishing coat in this way because many colours are susceptible to temperature differences which, however, are of no significance in the under-coat. Repairs can be treated by infra-red radiation because these can be handled as individual cases and given special attention. Individual parts in automobile construction, however, are symmetrical and can be given uniform treatment, and can also be treated in this way. Infra-red heating can also be used for drying paint on objects not made of steel, such as rubber. Further applications are the drying of latex sprayed on cloth as a cement, the drying of photographic films, and the heating of aluminium pistons in order to expand them for the insertion of piston pins. An outstanding advantage of the use of infra-red radiation is the shortening of time; moreover, less space is required than with other methods of drying. The cost is dependent primarily on the cost of electric power and it appears that under American conditions it is necessary for the power to cost less than 1.5 cents per unity.

Synthetic Starch

STARCH has been synthetically made from glucose in the University of California laboratories by Dr. W. Z. Hasseid and Mr. R. M. McCready. This is the first case on record of the production of starch otherwise than by the action of plants themselves. The reaction was brought about with the aid of the enzyme phosphorylase, which the two scientists isolated from potato juice. In its presence, glucose first combined with phosphoric acid to form a substance called phosphorylated glucose. This enzyme then broke this compound down into its original constituents, glucose and phosphoric acid, and recombined the glucose molecules into starch. The total amount of synthetic starch thus prepared by Hasseid and McCready is only 40 grams, or 1.4 ounces. It is not absolutely identical with natural starch, but resembles it so closely in chemical and physical properties that the differences are not significant.

Safety Measures Baulked by Official Muddle

REFERENCE was made in our "General News" column last week to a recent order—the Limitation of Supplies (No. 11) Order—restricting the output of toilet preparations for use against dermatitis. The expected repercussions have followed close on the heels of publication, and *The Times* records an interdepartmental squabble that would be amusing if it were not serious. The Ministry of Health, the Ministry of Labour, the Ministry of Supply, and the Board of Trade are all involved, and official correspondence on the subject, with its concomitants of civil service jargon, dubious syntax, and waste of paper, has been deluging the employees of the several departments concerned. The game of "passing the buck" is in full swing and the problem is forwarded from department to department. What has in fact occurred is that a certain liquid soap (coming under the head of "toilet preparations" as specified in the Order), which has been used for many years in printing offices, can no longer be supplied "unless required for the execution of a Government contract." Skin irritants liable to cause dermatitis are in constant use in the printing trade. The Ministry of Labour urges all workers to use an anti-dermatitis preparation, and the Board of Trade restricts the manufacture of these preparations. While the departments argue among themselves the workers must continue to run the risk of dermatitis, for the supplies of liquid soap have not yet arrived. As we go to press, a further announcement has come to hand to the effect that the Board of Trade has permitted the issue to factories, under special licence, of quantities of the material, in case of necessity, beyond the supplier's quota. Printers may therefore wash their hands with a clear conscience.

Russian Man-Power

"THE crucial importance of man-power in total war has perhaps never been so clearly shown as in the clash between Germany and Russia," says an article appearing in a recent issue of the *Manchester Guardian*. The article affords a particularly interesting parallel to our own present and future labour problems. Obviously if Russia is unable to increase her industrial output sufficiently to meet the calls of large-scale mechanised war, Great Britain and the United States will be forced to step into the breach. Increased output is tantamount to more workers and enlarged premises. With the huge Russian armies the number of men and women available for service in industry is not unlimited. There are no unemployed who could be drafted into the war industries. The Soviet Government has at its disposal, however, a labour reserve of about a million young skilled workers and another source in the shape of office employees at the factories. The latter are far too numerous, in the opinion of the State Planning Commission, which states that "in the plants there were 75 office employees to every 1000 workers in 1937, 90 in 1939, and 87 in 1940." A return to the 1937 level is advocated. An obvious way to increase production is to lengthen working hours and this has been done. In July last year the seven-hour working day was extended by one hour and there was a return to the six-day week from the previous five-day system. On the outbreak of war compulsory overtime of from one to three hours daily was instituted, while all holidays were scrapped. The result should be a 20 per cent. increase in output. Women will also no doubt play a big part in this drive for the tools of war. Even in peace time 40 per cent. of the workers in some parts of the heavy industries were women. But the most serious shortage will be among highly trained engineers and workmen; generally these are almost certain to be insufficient in numbers for war-time requirements.

Dolomite Working Under Primitive Conditions

A Cheap Refractory Material

by A. G. AREND

DURING the last war the scarcity of magnesite resulted to an appreciable extent in the substitution of dolomite in different forms, since, apart from all other considerations, the market price of magnesite became excessive. A number of patented refractories were successfully introduced, and although it is recognised that these do not possess physical characteristics equivalent to those of magnesite, they suffice for most metallurgical and chemical purposes. Bricks and blocks of dolomite are no longer manufactured, as their qualities do not correspond with those of magnesite, but patented compositions are widely utilised for directly lining furnace bottoms. The trouble with dolomite is that storage hydrates the lime, thus lowering the mechanical strength of the product, being known in extreme cases to bring about its disintegration. One patented composition is prepared by grinding together iron ore and dolomite to form an intimate mixture, and calcining at a temperature of some 1565° C., when the product shows an analysis ranging as follows: 42-55 per cent. lime, 25-38 per cent. magnesia, 8-14 per cent. ferric oxide and alumina, 6-13 per cent. silica (Liddell). Magdolite is a patented type of dolomite obtained by a special burning process, while Syndolag is composed of burned dolomite mixed with 10 per cent. basic open-hearth slag, followed by a further burning process. The analysis of Magdolite is 51.35 per cent. lime, 39.77 per cent. magnesia, 4.23 per cent. ferric oxide, 4.05 per cent. silica, and 0.67 per cent. alumina; while that of Syndolag shows 49.87 per cent. lime, 38.51 per cent. magnesia, 5.37 per cent. ferric oxide, 4.81 per cent. silica, and 1.06 per cent. alumina (Sisco).

Although a fair amount of literature has been published on the applications of dolomite in industrial pursuits, comparatively little has appeared on the initial winning of the crude material under primitive conditions in the various remote districts where it is known to abound to some extent, over and above the regular European deposits. The nature of the quarrying work involved means that much labour is required, and advantage is taken of cheap native labour to carry out the rough manual operations. Despite the fact that galleries are somewhat simply driven through the deposit, and the material transported by hand-driven skips and bogies, the breaking and crushing mechanism and the calcining units are of the latest designs so as to assist the rapid handling of a large output. Gangs of natives are able to work simultaneously at various points of the deposit, and roll down boulders of dolomite, which being of a more or less soft disposition tend to break up during such treatment.

Care is necessary in laying the rail lines systematically, so that numerous skips and bogies may always be at hand

Fig. 1. Dolomite quarry worked by native labour

Fig. 2. Galleries cut in a dolomite working, with rail lines radiating from a central point

to draw off the large tonnage of loose material, the boulders themselves being dealt with in specially constructed hopper-shaped bogies. A glance at the nature of the galleries (Fig. 2) will reveal that what might be described as roadways are cut in different directions so that a regular influx of material comes to the crushing plant, situated at a central point in the workings.

Loads of dolomite from each section are arranged to arrive in rotation to the crushers, and the latest system consists of using one exceptionally large jaw-crusher, which, in view of the soft nature of the material, reduces it as required in the least time possible. In some quarters this system was thought to involve a superfluous amount of power, but this was in fact justified by the speed with which great tonnages could be handled continuously. Where boulders of dolomite are rolled from a height, the broken mass tends to spread to a wide extent, involving much labour to gather together; the labour available, however, was cheap, and this was responsible for a continuation of the system. Where, however, the boulders or large pieces can be directly transferred from different galleries to the crusher, this gathering process is largely obviated.

Working with Large Jaw-Crushers

Most ordinary jaw-crushers are incapable of handling boulders, but the latest type makes use of a form of crane mounted on a tractor and equipped with gripping devices, which lift the boulder and place it directly in the mouth of the jaw-crusher. Much depends on the method of manipulating the large pieces as they are removed from the galleries so that an uninterrupted feed of material is assured. The mouth of the large crusher is approximately 7 by 5½ feet, which gives some indication of the size of dolomite boulders that can be dealt with, and these can be reduced to small size in a matter of little more than a minute. The naturally soft nature of the dolomite has, of course, much to do with the speed that can be maintained. Unlike the practice with ordinary small-sized crushers, it is necessary to make provision for an immediate removal of broken lumps, as an accumulation in such a short space of time might lead to confusion and transport troubles, and therefore the crusher is mounted on a firm concrete base, built well up above ground level, so that trucks can be continuously run under it to receive the output. Care is taken to see that all operations coincide, so that at no time is the plant left idle, and as a further precaution odd spare boulders are kept at hand, to ensure that the crusher may always be kept working.

In its general principles, the large jaw-crusher does not differ from those of small make, with fly-wheels at the sides, and swing jaw, but the total weight of one approximates to some 240 tons, whilst the swinging jaw alone

weighs 40 tons. The maximum tonnage crushed per hour amounts to 800 tons (although with harder material than dolomite, this would seldom exceed some 400 tons). The swinging jaw can be screwed into position with the assistance of levers, in much the same manner as with small crushers, so that pieces of any desired size can be obtained, but it is considered uneconomic to continue the process to provide a fine product. Dolomite of ½-in. mesh size is almost universally used, and although much of this is obtained directly from the large crusher, no intentional attempt is made to work so as to convert the large uncalcined pieces directly to this size. Unlike small crushers, the large plant has to be equipped with a set of lubricating valves, while the frame within which the crushing takes place is made of heavy alloy-steel sections, bolted together, as welding is not satisfactory for this kind of construction. The flywheels are approximately 11 ft. in diameter, and in view of possible danger, all native attendants have to keep clear of them, while the boulders are delivered from above.

In view of the heavy weight of the crusher, it is purposely made in sections so that it can be transported to remote districts in comparatively small lots and erected on the site. In one instance, it is claimed that a large crusher of the kind was transported in parts by aeroplane, no suitable roads being available in the district.

Improved Calcining Process

The dolomite is calcined in a type of cupola, which has seen many changes in design since the original coke-fired furnace was introduced, where the capacity was some 30 tons per 24 hours, and the coke consumption was 20 per cent. of the dolomite treated. In the ordinary way, the cupola was half filled with coke, followed by alternate layers of dolomite and coke, after which the calcined material was sorted to remove imperfectly calcined parts to be returned to the furnace. The dimensions for one of these cupolas was: inside diameter 9 ft., height to tuyères, 5 ft., height to feed door 14 ft., with 7 tuyères of 4 inches diameter (Gerson). The latest makes of cupola would be more correctly described as a revival or adaptation of stall-roasting hearths, since advantage is taken of producer-gas firing. For this purpose, a producer outfit is situated outside the building wherein the cupolas are constructed, and the gas is led into the latter by means of sets of ports, thus obviating contact between the solid fuel and the dolomite. The product is thus purer, and there is not the same need for sorting after calcining has been completed, while control of the heating is simplified, and can be left in the hands of native labour without danger of imperfect calcining. As with other cupolas of the kind, arrangements are made at regular intervals for removal of the calcined mass at the bottom, while the mass at the feed door is further added to.

As a rule, the calcining furnaces are four in number, and all receive their gas-fuel from the same producer, while

Fig. 3. The calcining furnaces

the carbon dioxide evolved is allowed to pass off to the atmosphere. Considerable research is still in progress to find a means of utilising this gas on the spot, or alternatively compressing it into cylinders for various other industrial uses, but so far nothing has been heard of the economic success of these proposals. The design of the cupola in many respects resembles that used for ordinary pig-iron melting except that near the bottom there are anything from four to six drawing doors for removing the calcined material. The need for calcining at a white heat is considered imperative in order that the product may be slight fritted, whereby the property of slaking will be slowed up. Despite all precautions, much of the dolomite which has to be stored for lengthy periods tends to disintegrate, but the slight fritting assists in acting as a buffer, and the lime takes longer to become hydrated.

The calcined dolomite is transferred to a dry pan-mill, until it passes the ½-in. mesh sieve, when it is ready for use in furnace bottoms. The ¼-in. size, formerly used to some extent, appears to have disappeared from the market, at least for the majority of lining purposes. One notable difference in the working of dolomite from deposits in primitive tropical districts is that extensive rainy seasons have to be contended with, and it is said that this was one of the first reasons why the producer-gas system of firing was introduced. When the atmospheric conditions vary widely, it is comparatively simple to control the temperature, and ensure the calcining being perfect. Instead of using the Orsatt, or other similar gas-testing apparatus, the latest automatic recording devices are used, so that little attention or supervision is necessary.

Both raw and dead burned dolomite are used in furnace construction and lining, and typical analyses of the two are as follows: Raw dolomite, 27.67 per cent. lime, 23.25 per cent. magnesia, 0.43 per cent. ferric oxide, 0.37 per cent. alumina, and 1.03 per cent. silica, ignition loss 46.93 per per cent.; dead-burned dolomite, 56.17 per cent. lime, 38.43 per cent. magnesia, 1.07 per cent. ferric oxide, 0.87 per cent. alumina, and 3.19 per cent. silica, while ignition loss should not exist other than as a trace.

Uses of Dolomite

The decision whether to use raw or calcined dolomite for repairs to electric furnaces engaged in the iron and steel industries depends upon the condition of the hearth bottom. Should the bottom be in fairly good condition, the raw material suffices, but if not, calcined dolomite, or one of the prepared patented dolomitic refractories, gives better results. When introducing a fresh bottom to the furnace, the double-burned refractory assures a greater span of useful life, and generally necessitates less frequent repairs. The raw product often suffices for the breasts of most furnaces, where a sufficiency of heat is usually present to ensure calcination and fritting to its neighbouring magnesite refractories. Although it is generally true that dolomite bricks have fallen into disuse nowadays, they are still required for the lining of the cupolas used for calcining the raw material, where the bottom half is made of these bricks, while the top half is chiefly built of firebrick followed by red brick, though some furnaces used chrome brick at the hot zone. Probably most dolomite is utilised for lining basic open-hearth furnaces, basic Bessemers, and electric furnaces, but it is also used for lining nickel, copper, and antimony refining hearths, and for various smaller repair purposes.

Leaflet C.B.61 of B.E.N. PATENTS, LTD., Hughenden Avenue, High Wycombe, Bucks, deals with the subject of spray painting guns. Included in these is the Model "DX" which is designed for high-class work where speed of coverage and, at the same time, economy of materials is essential.

Explosive rivets are now being manufactured in commercial quantities by E. I. du Pont de Nemours and Co., for use in aircraft production. The rivet is of an entirely new type; a high explosive is secreted in a cavity at the end of the shank, and heat is applied to the rivet head by an electric gun which detonates the charge. The explosion expands the charged end of the shank, forming a "blind" head and setting the rivet, the whole operation being carried out from one side.

LETTER TO THE EDITOR

The Salaries of Chemists

SIR,—Reports have recently appeared in the Press concerning the low salaries paid to chemists. Essentially, the suggestion is that salaries of less than £300 per annum are common.

It is, of course, desirable that the widest possible publicity should be given to conditions of this kind; but at the same time the experience of this Association should be of interest to all chemists.

For more than twenty years the British Association of Chemists insisted that the minimum salary for a chemist should be £350 per annum. Since the beginning of the war this minimum has been increased to £400 per annum. Members of the Association are instructed to refuse posts which are offered at a lower salary. This instruction has been consistently followed.

It is, of course, true that many chemists still accept posts where inadequate salaries are offered. This is because they have failed to take advantage of the protection the British Association of Chemists is able to afford them.

In fact, whilst a minimum salary has been fixed because in our experience a fixed minimum is convenient, the Association has always been interested in maximum rather than in minimum salaries. One of the most important services that the B.A.C. gives to its members is that of supplying an applicant with information concerning conditions, and in many cases detailed instructions concerning approach to individuals. This results in the individual being able to negotiate conditions of service of a more advantageous character than he would otherwise be able to secure.

A scale of salaries graded according to qualifications and experience has never been advocated by the B.A.C. It is not practicable at the present time, and if practicable it would be of doubtful value. The salary scales which obtain with us are of the order of £450 per annum for young chemists with brief experience to £2000 per annum for experienced men.

The larger the number of chemists who support the Association, the more effectively and universally this policy of adequate remuneration for valuable service rendered can be applied.—Yours faithfully,

C. B. WOODLEY,

175 Piccadilly, W.1. The British Association of
September 8, 1941. Chemists.

Cadmium and Indium

Recovery as Zinc Distillation By-Products

IN the manufacture of zinc by a distillation process some flue dust is obtained which contains in addition to zinc and its compounds several other metals and their compounds. The amount of the flue dust may be as high as 10 per cent. of the zinc distillate, although usually it is much smaller. The dust contains cadmium, lead, iron, arsenic, antimony, aluminium, and also rarer metals like indium. The concentration of the valuable metals is often so low that their recovery is not economical. In a recent paper in *Zapiski* of the Chem. Inst. Ukrain. Acad. Sci. (1940, *7*, 179) A. Nizhnik describes experiments undertaken with the view of increasing the concentration of cadmium and indium in the flue dust. Unfortunately no analysis of the original roasted ore is given and it is impossible to decide how complete was the extraction of the desired metals. The experiments were carried out in the course of a production run in the "Ukrzinc" factory. Two factors were changed systematically, namely, the amount of sodium chloride added to the ore and the frequency with which dust samples were taken.

When keeping the ore charge constant, the addition of sodium chloride was increased from 0.1 (*i.e.* 1 lb. of NaCl per 1000 lb. of ore) to 0.4 per cent. and 5 per cent., the total amount of the dust varied from 3.7 to 2.7 and 5.4 kg. The amount of Cd in the dust increased from 12 g. to 14 g. and 27 g., that is from 0.32 per cent. of the dust to 0.52 per cent. and 0.50 per cent. The amount of indium varied from 0.58 g. to 0.42 g. and 0.55 g., that is from 0.016 per cent. to 0.016 per cent. and 0.012 per cent. These concentrations are still too low to justify the recovery of cadmium and indium. But they can be considerably raised if only the first third or the first half of the flue dust deposited is collected and employed for preparation of Cd and In. For instance, the first 31 per cent. of the 3.7 kg. mentioned above contained 60 per cent. of the total cadmium and 77 per cent. of the total indium with concentrations of 0.61 per cent. and 0.039 per cent. respectively. In the first 37 per cent. of the 2.7 kg. of the second experiment 65 per cent. of the total Cd and 74 per cent. of the total indium were present; their concentrations were 0.91 per cent. and 0.031 respectively. Of the 5.4 kg. of the third experiment the first 57 per cent. were collected; they contained 88 per cent. of the total cadmium, but only 51 per cent. of the total indium.

It is possible, according to these results, to increase the concentration of Cd and In roughly by the factor 2 if 20-40 per cent. of the total amount of Cd and In are sacrificed. If cadmium is the main material to be obtained, addition of 5 per cent. of sodium chloride to the roasted ore is indicated; but if both cadmium and indium have to be recovered, not more than 0.2 per cent. of NaCl should be added.

Detection of the Chlorate Ion

A Specific Colorimetric Method

A NEW colorimetric method for the specific detection of the chlorate ion is described by M. B. Roy, of the Chemical Examiner's Laboratory, Agra, in *J. Ind. Chem. Soc.*, 1941, *18*, 3, pp. 165-6. The procedure described was devised mainly for detecting small amounts of chlorate in presence of chloride. The method is based on the fact that a solution of pyridine in sulphuric acid produces a permanent violet coloration with chlorate. The test is best carried out as follows: 3 c.c. of pyridine are taken in a test tube and 9 c.c. of conc. H_2SO_4 are added to it drop by drop with constant shaking. When the liquid has cooled, the reagent is ready for use. If the substance to be examined is in solution, the solution containing chlorate is carefully evaporated to dryness in a small porcelain basin, as the colour is well developed with solid chlorates. A drop or two of the reagent is then added to the solid substance when an intense violet colour is produced which is quite permanent. The colour produced varies from violet (0.01 to 1 mg. per c.c.) through deep violet (1 to 10 mg. per c.c.) to almost black (10 mg. per c.c. or over). It will be seen that the presence of chloride, bromide, iodide, perchlorate, nitrate, persulphate, and phosphate does not interfere with the reaction. Coloured substances, such as chromate and dichromate, mask the colour of the chlorate test, and bromate and iodate give a colour similar to that developed by chlorate.

Although the test is mainly qualitative in nature, it may also be applied for quantitative estimation of small amounts of chlorate in absence of interfering substances with a fair degree of accuracy, because the intensity of shade developed is proportional to the quantity of chlorate present. In quantitative work it is advisable to prepare matching standards by evaporating solutions containing known amounts of potassium chlorate in small porcelain basins, and if the unknown contains a large amount of chlorate it should be dissolved in water and an aliquot part evaporated to dryness.

The method is useful in determining the amount of sodium chlorate in certain weed-killers, in which chlorides are used as diluents of sodium chlorate, sold in the market for the purpose. It is also applicable to the determination of chlorate in mixture with the ingredients of typical nutrient water-cultures comprising nitrate, chloride, sulphate, and phosphate, because none of these ions interferes with the reaction.

Japanese Chemical Affairs

Government Control of Industry

(From a Special Correspondent)

THE Japanese Minister of Commerce and Industry, Admiral Teijiro Toyoda, recently called a joint conference in Tokyo of officials and civilian leaders concerned with industrial chemical enterprises. It is understood the conference discussed ways of alleviating the problems of raw material, transport, finance, and labour, as well as the question of expanding manufactures.

The Ministry of Commerce and Industry, it was afterwards stated, decided to control the Japanese chemical industry by establishing several control commissions in accordance with a broad system of classification, instead of through one control body. This is based upon the contention that the industry as such is variegated and hence does not have the uniformity necessary for one control as in the coal, iron and steel industries. According to this tentative plan a central control commission will be established for the pure and simple basic chemical manufacturing enterprises, while other enterprises of more complex nature will be classified into several groups, *e.g.*, sulphuric acid, ammonia, soda, carbide, organic chemical products, and tar products. Artificial leather, cement, rubber, fat, and oil plant will be treated separately and a control commission will be established for each. The recently organised Gas Manufacturers' Society may be made to function as the control commission for those enterprises within its purview coming under official jurisdiction.

The long-pending merger of the Nippon Nitrate and the Chosen Nitrate manufacturing companies to form a powerful single unit has come to the fore again, this time with good prospects of realisation. The managements, it is said, have come to realise that the execution of the plan will enable the enterprises to be in a better position financially to carry out their increasing production programme.

Salt Shortage

Manufacturers of soda who are hard pressed by the shortage of industrial salt and therefore are unable to carry out their production programmes are now advocating the establishment of a single salt import and distribution control company.

Salt imports and distribution are currently effected by Importers' Societies under the direction of the Salt Monopoly Bureau. But this system, in the opinion of soda manufacturers, is not sufficiently centralised and, moreover, as the consumers are deprived of any say in the matter, a really effective readjustment in the supply and demand cannot be made. A civilian control organisation, they believe, would have the necessary flexibility to handle the situation more efficiently.

Complete agreement of views has been reached between the Government and the manufacturers and exporters as regards the proposals to establish an organisation for the centralised control of all industrial chemical products destined for foreign markets, such as chemicals, medicines and drugs, paints and varnishes, dyestuffs, etc. A company, to be capitalised at three million yen, will exercise monopoly rights over the purchases of all commodities coming under its jurisdiction on behalf of exporters. Mr. Ichiro Hasegawa, president of the Nissan Chemical Manufacturing Company, has already been appointed president of the new organisation.

Casein Plastics Wastes in Feeding Stuffs

Low Nutritive Value

OWING to the difficulty of maintaining pre-war standards, a tendency has arisen to utilise as feeding-stuff certain trade wastes of assumed nutritive value. Mr. A. C. Burns, M.Sc., F.I.C., chief chemist of the Midland Agricultural College, discloses in an article in the *Fertiliser, Feeding Stuffs and Farm Supplies Journal* that he recently detected dyed formalised casein in a compound meal for cattle, and this form of protein had apparently been used, in all good faith, partly to replace other high-protein constituents. The assessing of food values on a basis of the usual determination of the so-called "crude protein" can be a dangerous practice, since this crude protein refers simply to the total nitrogen content, multiplied by 6.25 or other factor. Furthermore, the nutritive value of formalised casein in relation to that of the parent untreated casein is not simply a function of the protein content or of the total nitrogen expressed in terms of protein.

Indigestible Proteins

If actual feeding experiments are not conducted, it is desirable at least to determine the amounts of "true" and of "pepsin-soluble" (digestible) protein. Furthermore, quality is as important as is quantity, as influenced by the proportions of arginine, lysine, histidine, cystine in particular proteins. If these various points were not taken into consideration, then hoof, horn, leather dust, hair, etc., could replace meat or fish, whereas it is known that the digestibilities and food values of these latter wastes are of a very low order. The protein content of untreated dried casein is a little over 80 per cent., using the 6.38 conversion factor. The formaldehyde treatment, in the preparation of such casein plastics as buttons, combs, knitting needles, etc., yields a product containing almost 80 per cent. of crude protein, but protein of much lower digestibility. The digestibility of the protein in normal untreated casein averages 80 per cent., whereas examination of the formalised product, obtained by grinding white button blanks, revealed only 14.4 per cent. digestibility.

The "ash" content of the parent casein averages 6 per cent. and is of distinct mineral value to live-stock, in contrast with the higher ash content (11.6 per cent.) of the white button casein, much of which latter has no nutritional mineral value. Indeed, the higher ash content in the plasticised product is due to indigestible "filling" material. The above remarks can hardly apply to all varieties of plasticised casein wastes, the greater proportion of which is probably obtained from button manufacturers, in the form of drilling, grinding, and polishing dust. Mr. Burns has verified that, in the actual plastics industry, the use of such material for feeding purposes is not favoured, and that the responsibility must rest on certain intermediaries. Serious attempts are being made, however, to render these wastes more suitable for inclusion, in limited quantities, in cattle foods, but it is probable that the process will prove unprofitable.

Association of Scientific Workers

Pledge to Secure Greater Production

SCIENTIFIC workers and technicians from the major branches of the chemical industry, called together by the Association of Scientific Workers, met in Manchester on August 31 to discuss the achievement of maximum technical effort behind war production, and the problems of scientific staffs.

A resolution, unanimously agreed upon, expressed the belief that the use and co-ordination of scientific and technical man-power was not commensurate with the effort needed in the present critical phase of the war. To reach the highest production, the delegates accordingly pledged themselves to initiate a plan of campaign, for the carrying into effect of which the following scheme of action was proposed:—

1. The calling of local works and laboratory meetings to apply the programme to local conditions.
2. The initiation of approaches by the association to all organisations concerned with production, including managements of firms and national and regional production boards.
3. The closest co-operation with other trade unions.
4. The strengthening of the association as the representative body of all technical and scientific staff.

Oil Chemistry Development

Dr. Dunstan on the Rise of Petroleum Products

THE illuminating lecture delivered by Dr. A. E. Dunstan (chief chemist of the Anglo-Iranian Oil Company) at a joint meeting of the Institute of Fuel and the Society of Chemical Industry at Bristol last July, entitled "Oil in Peace and War," has now been published (*J. Inst. Fuel*, 1941, *14*, 79, pp. 213-9), with excellent illustrations taken from the lecturer's slides.

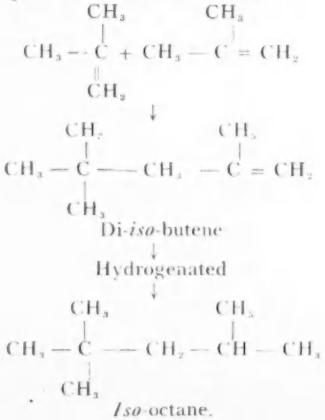
Some figures quoted at the beginning of the lecture are of great interest for comparison. World production of petroleum, for instance, amounted to 268,000,000 tons in 1938: percentage production of petroleum (by countries) in 1940 credits the U.S.A. with 63 per cent., the British Empire with 3 per cent., and other countries (U.S.S.R., Mexico, S. America, Iran, Iraq) with 34 per cent. A notable reserve source of fuel oil exists in the production of oil shale, which in 1938 amounted to 1,500,000 tons in the U.K. (mainly Scotland), 1,450,000 in Estonia, 700,000 in the U.S.S.R. (estimated from 1936 figures) and 130,000 in France. Further reserves in Canada and the U.S.A. (principally Utah and Colorado) are colossal.

Following a discussion of the operations involved in the production and refining of crude oil, notably the cracking process, whereby the oil industry has improved on the straight-run natural product, consideration was given to the development of various methods of utilising petroleum gases. The earliest attempts to utilise the lower paraffin hydrocarbons depended on pyrolysis, a drastic thermal treatment. Unfortunately methane, the principal fraction, proved recalcitrant, and yields were low; and in recent years the process has been confined to the higher homologues.

A typical analysis of the gases produced shows: CH_4, 58 per cent.; C_2H_4, 7 per cent.; C_2H_6, 13 per cent.; C_3H_8, 11 per cent.; and $C_4H_8 + C_4H_{10}$, 5 per cent. From the point of view of practical politics, these are concentrated into C_3 and C_4 cuts: the lighter gases at the moment being of fuel value only, although this is only a temporary phase. Clearly, the last to be utilised will be methane. It is on the C_4 fraction that most work has been done. This contains *n*-butane, *iso*-butane, the two *n*-butenes, and *iso*-butene in proportions that vary with the cracking conditions. Also present is butadiene.

An early commercial process was concerned with *iso*-butene. When treated with 65 per cent. sulphuric acid at ordinary temperatures this hydrocarbon is absorbed and converted into *tert* butyl alcohol. On raising the temperature to 100° C. a split takes place—"nascent" *iso*-butene is regenerated and immediately forms the dimer and, to a less extent, the trimer. Schematically, the change is as follows: there being a final hydrogenation to *iso*-octane.

Dimerisation of iso-*butene.*



Di-*iso*-butene

↓

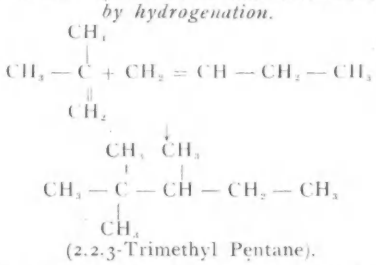
Hydrogenated

Iso-octane.

(2.2.4—Trimethyl Pentane).

The remaining *n*-butenes must now be considered. Using hot sulphuric acid, a co-polymerisation of the total butenes ensues.

Co-polymerisation of iso-*butene and* n-*butenes, followed by hydrogenation.*

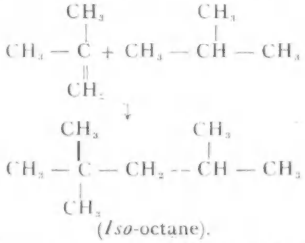


(2.2.3-Trimethyl Pentane).

Actually, there is a whole range of catalysts that bring about the polymerisation or the co-polymerisation of these defines. Chief amongst these is a variety of phosphates, *e.g.*, hydrogen, copper and cadmium, and further various well-known compounds of alumina and silica.

A further development arose when it was discovered that *iso*-butane would smoothly unite with the butenes and yield *iso*-octane in one operation.

Addition of iso-*butene to* iso-*butane.*

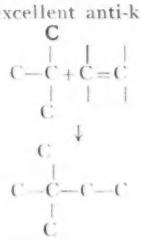


(*Iso*-octane).

This reaction, not quite yet fully explained and possibly not quite developed to the full, is one of the most elegant syntheses accomplished in the field of petroleum chemistry. It is conveniently termed "alkanation," although the expression alkylation is perhaps more commonly used, especially in America.

The alkanation reaction has been fully studied in the case of *iso*-butane, coupled with the two normal butenes, with di-*iso*-butene and, in fact, with the whole C_4 cut. Curiously enough if the major end product (*iso*-octane) is similarly treated with sulphuric acid, there appears to occur in effect a reverse reaction and the final products are similar to those formed in the initial reactions.

The union of two hydrocarbons, one containing the tertiary carbon atom characteristic of *iso*-butane and the other an olefine, is, as just explained, carried out in the presence of a catalyst. But by the mere impact of temperature and pressure *iso*-butane will add on ethylene to yield neohexane, an excellent anti-knock fuel.



To recapitulate:—

2 molecules *iso*-butene → di-*iso*-butene → *iso*-octane

n-butene + *iso*-butene → co-dimer → *iso*-octanes

iso-butene, *n*-butenes + *iso*-butane → *iso*-octane

Clearly, the last operation gives the greatest yield of *iso*-octane from the C_4 fraction, and in one operation.

It is rather important at this stage to stress the characteristic behaviour of the tertiary carbon atoms in *iso*-butane and its allies. Normal butane does not react in the same way. Fortunately, however, *n*-butane can be isomerised, and this operation is brought about by catalysis with aluminium chloride in various forms.

Petroleum Needs Anticipated

There are many directions in which petroleum technologists are immediately concerned with urgent needs that must be satisfied, and it is rather interesting to find that they have in recent years anticipated these requirements. Take, for example, developments in connection with rubber. The first synthetic rubber was Buna, a condensation product of butadiene, or dimethyl butadiene with itself. Butadiene is a four-carbon chain structure, and can be produced by cracking, and is quite readily polymerised, for example, over sodium into a material of the rubber-like type. Buna S is a joint polymer of butadiene and styrene. Perbunan (formerly Buna N) again is produced by the concomitant upbuilding of butadiene and acrylic nitrile. Butyl rubber is the result of cross polymerisation of *iso*-butene and two per cent. of butadiene.

From all these polymers by suitable treatment are derived materials of the rubber type, but possessing specific properties of their own, *e.g.*, insolubility in mineral oil. From an entirely different angle the interesting work of E. C. Williams (*see* THE CHEMICAL AGE, February 22, 1941) shows that propylene by means of hot chlorination yields allyl chloride, which on chlorhydrination affords the dichloro derivative that on hydrolysis gives glycerol. Glycerol made in this way may be a competitor with glycerol made by the usual fat splitting. Glycerol made as simply as this and esterified with fatty acids obtained by the oxidation of petroleum waxes will give foodstuffs.

Apart from foodstuffs, there are other urgent war applications of petroleum products. High-speed diesel oils and lubricants are obvious examples. It is now confidently asserted that toluene extracted direct from mineral oil or made therefrom by cracking or produced by the cyclisation of *n*-heptane can meet all calls made for high explosives. There are, further, the plastics that can be obtained from multitudinous sources, petroleum products being not the least important. And of fundamental interest in industrial chemistry is the wide range of solvents, glycols, ethers, alcohols, esters, chloro-derivatives, and the nitro-paraffins.

A CHEMIST'S BOOKSHELF

AN INTRODUCTION TO ORGANIC CHEMISTRY. By John William Baker, D.Sc., Ph.D., A.R.C.S., F.I.C. London: Dent. Pp. 177. 3s.

This latest addition to Dent's "Modern Science Series" (produced under the direction of Dr. E. J. Holmyard), really is what it claims to be, viz.: an *introduction* to the subject with which it deals. And it is an introduction in proper form, assuming no prior knowledge on the part of the reader beyond an acquaintance with the general principles of inorganic chemistry. To any student with a reasonably systematic mind—and surely no one can hope to succeed as a chemist without a mind of that type—the broad principles of organic chemistry are made clear in a series of ordered steps, and no attempt is made to be exhaustive and consequently to deluge the tyro with a vast flood of new and unfamiliar compounds. It is reasonably contended that if he can understand the principles governing the simpler paraffins (for example), the student will be able to apply them to the higher paraffins in due course. Having thoroughly digested this admirable and inexpensive volume, and having carried out the standard experiments with which each chapter concludes, the young chemist should be able to go on to the reading of the great textbooks of organic chemistry, and to the work which follows such reading, with a clear head and a sure mind.

New American Propellant

A "Triple-Threat" Explosive

HOW three of the most powerful explosives known—nitroglycerine, nitrocellulose, and trinitrotoluene—may be combined into a single "triple-threat" propellant powder for firing shells over long distances is described in U.S.P. 2,247,392 granted to Milton F. Lindsley, of Kings Mills, Ohio, and assigned to E. I. du Pont de Nemours and Company. The process is said to be safe, since it is carried out under water. Finely divided particles of nitrocellulose colloided with nitroglycerine are suspended in water maintained at a temperature above the melting point of the trinitrotoluene. The latter is next suspended in water in a molten condition and then broken up into fine globules by agitation. The two water suspensions are then mixed together. The trinitrotoluene attacks and agglomerates the finely divided nitrocellulose-nitroglycerine particles, thus forming small grains of powder containing all three explosives. The suspension is chilled below the melting point of the trinitrotoluene to complete the formation of the grains.

Alumina from Alunite

Economic Process Patented in U.S.A.

A PATENTED process for the economic conversion of alunite into alumina has been developed by Arthur Fleischer, of Kalunite, Inc., Salt Lake City, Utah, after ten years' laboratory and pilot-plant research. According to a recent survey of the U.S. Bureau of Mines, over 13,750,000 tons of pure alunite are accessible in the western states of Utah, Arizona, Colorado, Nevada, California, and Washington, of which 3,800,000 tons are available in Utah for treatment by the Kalunite process, enough to occupy for ten years a plant producing 200 tons a day. The cost of producing alumina from alunite by the Kalunite process is £35 per ton, equivalent to 11.865 cents per lb. for aluminium metal—a price that would enable the product to compete with the aluminium recovered by the Bayer process as used by the Aluminium Co. of America. The new process starts with the production of potassium alum and sulphate from the alunite by the time-honoured ignition and sulphuric acid method. The potassium alum, noted for its property of separation by crystallisation from solution, is then put into an autoclave and converted to basic alum. This in turn is calcined to effect the separation of the sulphuric acid from the alumina, leading to a non-chemical mixture of alumina and potassium sulphates. The latter is then removed by leaching.

Bacteria for Oil Location

Test with Hydrocarbons in Soil

HOW hydrocarbon-consuming bacteria can be utilised in prospecting for oil is revealed in a patent (U.S.P. 2,234,037) assigned to the Standard Oil Company. The bacteria concerned belonged to the species *Bacillus methanicus;* they thrive on the methane and other hydrocarbons found in the soil above subterranean oil deposits.

In practising the new method of prospecting, samples of ordinary builders' sand are inoculated with the bacteria. The inoculated samples, each about 100 cubic inches in size, are then planted at regular intervals in the area to be prospected, and are permitted to remain in the earth for a period of from 10 to 14 days. During that time the bacteria propagate by feeding on any hydrocarbons naturally occurring in the earth. The samples are next dug up and examined for any increase in hydrocarbon and bacteria content. This is revealed by treating the samples with sodium peroxide, which causes a colour change, the degree in change of colour being a measure of the increase. According to the inventor of the process, Millard S. Taggart, junr., any anomalous increase in bacteria or hydrocarbon content indicates the presence of oil deposits under where the samples were buried.

Personal Notes

MR. G. H. LAMB has been appointed an additional director of British Emulsifiers, Ltd.

MR. L. G. BURLEIGH, from Imperial Chemical Industries, Ltd., has been appointed by the Ministry of Supply to be Controller of Factory Transportation, in succession to Major F. Gilbert, appointed Assistant Director-General, Supply Services.

PROFESSOR SIR LAWRENCE BRAGG will continue in office as President of the Institute of Physics for another year from October 1, with PROFESSOR W. MAKOWER as Vice-President, MAJOR C. E. S. PHILLIPS as Hon. Treasurer, PROFESSOR I. A. CROWTHER as Hon. Secretary, and PROFESSOR J. CHADWICK and MR. D. C. GALL as Ordinary Members of the Board. Seven Fellows and ten Associates were likewise elected at the recent meeting of the Institute.

Obituary

MR. WALTER MOORE, of the Clydevale Oil and Colour Co., died at Glasgow on September 3, aged 70.

MR. FRANCIS WALKER, who died at Dulnain Bridge on August 30, was well known in the Scottish chemical trade as the late executive manager of Imperial Chemical Industries, Ltd.

MR. HENRY DACRE MADDEN, late engineer and manager of the Cardiff Gas Light and Coke Company, died at Cheltenham on September 8, aged 65. He was one of the leading exponents of the development of gas for industrial purposes, and had been chairman of the executive committee of the British Commercial Gas Association.

MR. HENRY A. GREEN, who died on September 6 at Shenfield, Essex, aged 56, was managing director of Murex, Ltd. He had been connected with the company for over thirty years. His achievements in the field of metallurgy were of great practical value and have constituted a notable contribution to the national effort.

New Control Orders

Waste Lubricating Oil

THE Secretary for Petroleum has issued an Order, dated August 26, licensing any person to dispose of waste lubricating oil to a refiner or to any person for resale to a refiner. In this licence the expression "waste lubricating oil" means lubricating oil which has been used for lubricating any vehicle, plant or machinery, or used transformer oil or lubricating oil or transformer oil which has been contaminated and the expression "refiner" means a person carrying on the business of refining, re-treating or reconditioning waste lubricating oil. This licence may be rescinded or varied at any time by the Secretary for Petroleum.

FATTY ACID INSECTICIDES

A recent investigation of the insecticidal properties of a number of fatty acid derivatives, quoted by *Paint Technology, 6,* 66, p. 148, revealed that certain primary and secondary amines are highly toxic to the common house fly. Octyl and decyl amines show great insecticidal activity, but their use is limited by the irritant effect of primary amine solutions on the nose and throat. Dioctyl amine, however, not only has an exceptionally high paralysing and killing power for insects, but is also comparatively non-irritating to humans, non-toxic to domestic animals, and free from objectionable odour.

The United States Vanadium Company, a subsidiary of the Union Carbide Company, is about to place in operation a tungsten concentrating plant with a capacity of 1000 tons per day at Pine Creek, near Bishop, California. It is said that there is enough ore blocked out to keep the mill operating for 20 years and a prospect that large supplementary deposits will be developed.

British Chemical Prices

Market Reports

THE general chemicals market during the past week has pursued a steady course and no outstanding changes fall to be recorded. A fair weight of new business is in circulation, and contract deliveries have been absorbed at a steady pace. Acetic, tartaric and citric acids are active items and there is a brisk inquiry for available quantities of oxalic acid. Formaldehyde continues very firm. Amongst the soda products there is a good demand for yellow prussiate, bichromate, and chlorate; in the potash section the volume of business continues to be regulated by the supply position. Activity in the market for coal tar products is mainly concerned with the fulfilment of existing contracts. Carbolic acid is strong and there is a ready outlet for available parcels of cresylic acid. Xylol is firm and toluol continues in good demand. With the exception of pitch the undertone throughout this section is firm.

MANCHESTER.—Although there have been few changes of any consequences on the Manchester chemical market during the past week, there is no mistaking the general firmness of prices both in heavy chemicals and in tar products. Most of the soda compounds met with a steady demand and a ready outlet continues for any supplies of potash materials that make their appearance. The call for supplies of other chemicals, including the heavy acids, for the most part is on steady lines. With regard to the by-products, pronounced firmness is still a feature, especially in the cresylic acids and the light distillates, and business generally is on a brisk scale.

GLASGOW.—In the Scottish heavy chemical trade there have been steady day-to-day demands for general chemicals for home trade during the week. The export business has been rather quiet. Prices generally remain firm about the previous figures with a tendency to rise. Bichromates have again advanced during the past week.

Price Changes

Alum.—Loose lump, £10 10s. per ton, d/d, nominal.
Aluminium Sulphate.—£10 15s. per ton, d/d.
Bleaching Powder.—Spot, 35/37%, £11 per ton in casks, special terms for contract.
Creosote.—Home trade, 5¼d. to 7¼d. per gal., f.o.r., maker's works; exports, 6d. to 6½d. per gal, according to grade. MANCHESTER: 5½d. to 7¼d. per gal.
Cresylic Acid.—Pale, 99/100%, 4s. 3d. per gal. MANCHESTER: Pale, 99/100%, 4s. 5d. per gal.
Lead Nitrate.—About £46 10s. per ton, d/d in casks.
Naphtha.—Solvent, 90/160, 2s. 6d. to 2s. 10d. per gal.; heavy, 90/190, 1s. 10½d. naked at works. MANCHESTER: 90/160, 2s. 6d. to 2s. 9d.
Oxalic Acid.—From £60 to £65 per ton for ton lots, carriage paid, in 5-cwt. casks; smaller parcels would be dearer; deliveries slow.
Soda, Caustic.—Solid, 76/77%, spot, £15 7s. 6d. per ton, d/d station.
Sodium Nitrate.—Refined, £14 10s. to £15 per ton for 2-ton lots, d/d.
Xylol.—Commercial, 3s. 6d. per gal.; pure, 3s. 10d. MANCHESTER: 3s. 4d. to 3s. 10d. per gal.

An explosion followed by fire shook the Welland chemical factory at Niagara Falls, Ontario, on September 3. At least one man was killed and numbers were seriously injured, states Reuter.

German production of buna, or artificial rubber, is likely to experience a set-back after the successful bombardment by the R.A.F. last week of the skilfully concealed factory at Hüls, north of Crefeld, near the W. bank of the Rhine. Further damage to the German-controlled chemical industry was inflicted at the same time by the Coastal Command's attack on the fish-oil factory at Bergsö, off the west coast of Norway.

Exports of quebracho extract from the Argentine during the first six months of 1941 totalled 73,400 tons, valued at 19,921,000 pesos, compared with 75,600 tons, valued at 19,033,000 pesos, in the same period of 1940, a decline of 2200 tons in quantity, but an increase of 888,000 pesos in value. Imports of chemicals, oils, paints, etc., for the same period of 1941 were valued at 40,701,000 pesos, compared with 55,110,000 pesos in the corresponding half of 1940, a decline of 14,409,000 pesos or 26.1 per cent.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

Process of purifying water.—American Cyanamid Co. (United States, July 31, '40.) 9754.

Flotation reagents.—American Cyanamid Co. (United States, Nov. 6, '40.) 9822.

Sulphonyl cyanamides.—American Cyanamid Co. (United States, Nov. 19, '40.) 9924.

Method of processing dolomite.—American Zinc Lead and Smelting Co. (United States, Aug. 3, '40.) 9946.

Resinous ester products.—Bakelite, Ltd. (United States, Aug. 3, 40.) 9756, 9825.

Process for condensing peat.—K. Barr. 9842.

Process of treating peat for the manufacture of fuel.—K. Barr. 9943.

Manufacture of titanium dioxide pigments.—British Titan Products Co., Ltd. (United States, Aug. 2, '40.) 9827.

Methods of recovering calcium-free beryllium sulphate crystals.—Brush Beryllium Co. (United States, Aug. 3, '40.) 10013.

Decarburisation of steels and alloys thereof.—G. H. Bull and H. Allsop. 9868.

Manufacture of thymol.—B. T. Bush, Inc. (United States, Aug. 2, '40.) 9859.

Vapour-proof storage, etc., containers.—Dewey and Almy, Ltd. (Dewey and Almy Chemical Co.). 10009.

Manufacture of polymeric materials.—E. I. du Pont de Nemours and Co. (United States, Aug. 2, '40.) 9805.

Textile treating materials.—E. I. du Pont de Nemours and Co. (United States, Aug. 3, '40.) 9900, 9901, 9902, 9903, 9904, 9905, 9906, 9907, 9908.

Amino alcohol esters.—H. G. C. Fairweather (American Cyanamid Co.). 9925.

Manufacture of copper-containing trisazo dyestuffs.—J. R. Geigy A.-G. (Switzerland, Aug. 2, '40.) 9802.

Preparation of hydrobromic acid.—F. Goldschmidt and F. Deutsch. (Palestine, Aug. 10, '40.) 9914.

Manufacture of soap.—Lever Bros. and Unilever, Ltd. (United States, Aug. 3, '40.) 9817.

Production of glass substitute.—Lumsden and Mackenzie, Ltd., and C. Garrett. 9994.

Method of converting domestic refuse into fertilisers.—F. G. Mitchell. 9935.

Manufacture of aluminium sulphate, etc., and apparatus therefor.—Monsanto Chemical Co. (United States, Aug. 2, '40.) 9813. (United States, Dec. 28, '40.) (Cognate with 9813.) 9814.

Manufacture of carbon.—R. H. H. Morley. 9845.

Process for obtaining sulphonamide derivatives.—Parke, Davis and Co. (United States, Aug. 3, '40.) 10001.

Plastic fire-proof compositions.—H. Rose and Celotex, Ltd. 9934.

Treatment of tar, etc.—O. A. von Smekal and M. E. Pokorova. 9917.

Treatment of tar, tar oils, etc.—O. A. von Smekal and M. E. Pokorova. 9919.

Heat-exchange apparatus.—O. A. von Smekal and M. E. Pokorova. 9921.

Boron trifluoride catalysts.—Standard Oil Development Co. (United States, Aug. 3, '40.) 9730.

Magnetic alloy of iron and aluminium.—Standard Telephones and Cables, Ltd. (United States, Aug. 7, '40.) 9798.

Electro-cleaning baths.—Vauxhall Motors, Ltd., and H. S. Bavister. 9870.

Fermentative production of acetone and butyl alcohol.—C. Weizmann. 9996.

Construction of cracking plants, etc.—C. Weizmann and H. Steiner. 9995.

Chemical processes, and apparatus therefor.—C. Weizmann, E. Bergmann, H. Steiner, and H. E. Charlton. 9997.

Manufacture of rubber-like substances.—J. R. Whinfield and W. K. Birtwistle. 9840

Reduction of aluminium from its ores.—H. N. Wright. 9768.

Complete Specifications Open to Public Inspection

Catalytic cracking of hydrocarbon oils.—Texaco Development Corporation. Jan. 13, 1940. 1862/41.

Process of desulphurising iron-pyrites ash.—S. A. de Manufactures des Glaces et Produits Chimiques de St. Gobain, Chauny, et Cirey, and G. C. Cry. Jan. 5, 1940. 3263/41.

By-product coke ovens and processes of operating the same.—P. M. Pinckard. Jan. 31, 1940. 4150/40.

Method and apparatus for regulating the addition of a foam-suppressing agent in fermentation, etc.—A/S de Danske Sprit-Fabrikker. Feb. 2, 1940. 687/41.

Process for the production of vitamin B1.—Chinoin Gyogyszer es Vegyeszeti Termekek Gyara R.T. (Dr. Kereszty and Dr. Wolf). Jan. 25, 1940. (Cognate application 918/41.) 917/41.

Synthetic resinous compositions.—British Thomson-Houston Co., Ltd. Feb. 1, 1940. 1214/41.

Process for protecting wool, etc., against moth, etc., the production of acyl sulphonamides for the purpose, and materials treated therewith.—J. R. Geigy A.-G. Feb. 2, 1940. (Cognate application, 1278/41.) 1277/41.

Manufacture of organic carboxylic acids.—E. I. du Pont de Nemours and Co. Jan. 31, 1940. 1281/41.

High-grade motor fuels from straight run and similar hydrocarbons.—Houdry Process Corp. Feb. 1, 1940. 1776/41.

Complete Specifications Accepted

Process for the preparation of diaryl-dialkylethylene derivatives.—Chinoin Gyogyszer es Vegyeszeti Termekek Gyara R.T. (Dr. Kereszty and Dr. Wolf). Feb. 7, 1939. (Addition to 537,976.) (Cognate application, 2062/40.) 537,993.

Dyeing of textile fibres.—Courtaulds, Ltd., C. C. Wilcock and C. P. Tattersfield. Jan. 12, 1940. 537,964.

Method of recovering calcium lactate and lactic acid from fermented mashes.—J. Muller. Jan. 20, 1939. 538,060.

Silvering of mirrors and the like.—Peacock Laboratories, Inc. Oct. 27, 1939. 537,987. Nov. 16, 1939. 538,026.

Preparation of cellulose from wood and other lignocellulosic materials.—S. C. Bate. Jan. 16, 1940. 538,023.

Manufacture of thionyl chloride.—H. R. C. Pratt and Imperial Chemical Industries, Ltd. Jan. 16, 1940. 538,028.

Production of ethanol from fermented wort and other alcoholic solutions.—Celec Corporation, Ltd., and S. M. Phillips. Feb. 16, 1940. 538,102.

Lactones of 2-methyl-3-alkoxy-4-hydroxymethyl-5-carboxy pyridine.—Merck and Co., Inc. April 13, 1939. 538,000.

Method and apparatus for mixing and blending materials some of which are in a finely divided state.—A. B. Smith and C. R. Smith. May 6, 1940. 538,005.

Manufacture of sulphonamide compounds.—British Colloids, Ltd., J. I. M. Jones and R. T. M. Haines. June 5, 1939. 538,302

Processes for the treatment of molasses fermentation solutions.—U.S. Industrial Alcohol Co. Oct. 18, 1938. 538,394.

Process for the production of heptene.—Gas Light and Coke Co. and R. H. Griffiths. Jan. 27, 1940. (Cognate application, 135/41.) 538,353.

Manufacture of therapeutic substances.—British Colloids, Ltd., J. I. M. Jones and I. E. Balaban. Oct. 9, 1939. 538,354.

Bath-presses for the treatment of cellulose sheets with caustic lye.—Snia Viscosa (Soc. Nazionale Industria Applicazioni Viscosa). Oct. 6, 1938. 538,355.

Apparatus for gravity separation of granular material.—A. A. Hirst and Simon-Carves, Ltd. Dec. 30, 1939. (Cognate application 15624/40.) 538,400.

Manufacture of hydrocarbons by alkylation.—Standard Oil Development Co. March 4, 1939. 538,307.

Tar products.—Midland Tar Distillers, Ltd., and D. W. Parkes. Jan. 19, 1940. 538,308.

Fertilisers.—American Zinc Lead and Smelting Co. Feb. 4, 1939. 538,347.

Methacrylic anhydride and methods of making the same.—Norton Grinding Wheel Co., Ltd. Jan. 30, 1939. 538,310.

Recovery of magnesium from vapour-phase mixtures.—A. Abbey (Dow Chemical Co.). Jan. 26, 1940. 538,311.

Synthetic resin compositions, and abrasive and other articles made therefrom.—Norton Grinding Wheel Co., Ltd. Jan. 28, 1939. (Cognate application, 1798/40.) 538,406.

Purification of compositions containing sulphonyl halides.—Colgate-Palmolive-Peet Co. June 29, 1939. 538,374.

Preparation of aliphatic derivatives containing sulphur.—Colgate-Palmolive-Peet Co. June 29, 1939. (Cognate application 1830/40.) 538,407.

Preparation of detergents.—Colgate-Palmolive-Peet Co. Nov. 2, 1939. 538,408.

Purification of organic sulphonated compounds.—Colgate-Palmolive-Peet Co. Jan. 31, 1939. 538,375.

Amended Specification Published

Alloy Steel.—Sandvikens Jernverks A/B. 504,224.

General News

By scrapping the plates of obsolete Braille books, the National Institute for the Blind has contributed 10 tons of zinc to the war salvage campaign.

The bill embodying the Glen Affric hydro-electric scheme, which was designed to utilise the water-power of that part of the Highlands for industrial development, was opposed by the Government, and rejected without a division on Wednesday.

Two men were fined £5 each last week at Southport, one for stealing and the other for receiving 15 gallons of solvent naphtha, the property of William F. Metcalf, Ltd., tar distillers, of Russell Road, Southport.

The Control of Iron and Steel (No. 15) Order, Direction No. 2 (S.R. and O., 1941, No. 1306), made by the Ministry of Supply, with effect from August 31, refers to the use of iron (other than pig iron) for Government purposes.

Applications for licences for caustic potash and carbonate of potash and all correspondence relating to these products should, in future, be sent to Miscellaneous Chemicals Control, 1 Chester Street, London, S.W.1. (*see* THE CHEMICAL AGE, August 30, p. 121.)

The age of reservation of certain occupations in the tinplate industry is to be raised from 18 to 30 from the beginning of October. Some of the men are needed in other sections of the iron industry. Those who have not transferred to reserved work by October 4 will be called up for the Forces.

The Board of Trade has received information that the following commodities have become subject to licence, as from September 10 on exportation from the U.S.A.: synthetic fibres, wood, natural asphalt or bitumen, non-ferrous metals and precious metals.

The Export of Goods (Control) (No. 31) Order, 1941 (S.R. and O., 1941, No. 1310) prohibits, as from September 4, the export of various kinds of aluminium goods, comprising certain domestic articles and rivets, including tubular rivets. The Control of Magnesium (No. 2) Order, 1941 (S.R. and O., 1941, No. 1314) slightly varies the wording of the corresponding No. 1 Order (S.R. and O., 1940, No. 1312) as regards the price of the metal.

The damage sustained by Liverpool Technical College in the heavy air-raids on Merseyside has now been indicated in the report by the Principal (Mr. R. R. Butler) on the year's work. The whole of the college extension in Water Street—18 lecture rooms and equipment—was destroyed by fire, and in the Byron Street premises one lecture room was damaged and a chemical laboratory burnt out. The student capacity of the college has thus been reduced by 20 per cent. Nevertheless, the college has been able to co-operate with the university by offering the use of its undamaged equipment to replace certain destroyed apparatus in the university's heat-engine laboratories.

The Manchester College of Technology announces, in its prospectus for 1941-42, the usual course of advanced study, leading to the degrees of M.Sc.Tech., Ph.D., and the Diploma of Chemical Engineering; also undergraduate courses in applied chemistry extending over three years and leading to the degree of B.Sc.Tech., and to University certificates in general chemical technology, metallurgy and assaying, chemical technology of fermentation processes (including brewing), electro-chemistry, colouring matters (higher course), foodstuffs (higher course), fuels (higher course), chemical engineering (higher course), chemistry of textiles (bleaching, dyeing, printing and finishing), and paper manufacture.

Foreign News

Details of the 20 principal articles imported into Brazil from Great Britain in 1940 have now been published by the Federal Council of Foreign Trade. They include caustic soda (17,976 tons, valued at 29,985 contos), soda ash (15,922 tons, valued at 12,753 contos), tin (285 tons, valued at 6587 contos), and zinc oxide (1696 tons, valued at 4612 contos).

From Week to Week

A new type of insulation for electric wires (U.S.P. 2,249,280, to W. Koch, Hercules Powder Co.) consists of ethyl cellulose mixed with mineral oil, with or without added solid filler. This is then painted on the wires or other conductors, and has the advantage of not becoming brittle at low temperatures.

The manufacture of polyvinyl chloride, a rubber substitute resistant to water and to acids, is being undertaken by Shawinigan Chemicals, Ltd., a subsidiary of the Shawinigan Water and Power Company. This will be the first occasion on which this product has been made in Canada; the plant is due to come into operation next spring.

Imports of acetone into Japan will, it is said, be unnecessary in 1941. The Asahigawa factory is scheduled to produce acetone as well as butanol, and other firms, including the Dai-Nippon Celluloid Co., are expected to increase their respective outputs of these products. Domestic output of acetone is said to have accounted for 70 per cent of the consumption for 1940. Imports from the United States, believed to be the principal supplier, amounted to 2,400,000 lb. valued at $234,000 in 1940, compared with 8,500,000 lb. valued at $585,000 in 1939.

Forthcoming Events

A meeting of the London Section of the **British Association of Chemists** will be held at the Café Royal, Regent Street, W.1, on **September 13** at 2.30 p.m., when Mr. T. McLachlan, D.C.M., A.C.G.F., F.I.C., will open a discussion on "The Training of the Chemist." Mr. W. C. Peck, M.Sc., A.I.C., M.I.Chem.E., will be in the chair. The meeting is open to members of kindred societies.

The opening meeting of the Midlands Centre of the **Electro-depositors' Technical Society** will take place on **September 16,** at 6.30 p.m., in the James Watt Memorial Institute, Great Charles Street, Birmingham, 3. The meeting will be devoted to a discussion on the problems confronting the electro-plater as a result of (a) the special finishing processes which have been specified on war work, *e.g.*, cadmium and tin plating, anodising, heavy chrome plating, etc., and (b) the difficult conditions under which plating has to be carried out to-day. It is hoped that a good proportion of "practical" men will be present to take part in the discussion which will be entirely informal. Mr Riley, who is well known to Midland members, will open the discussion. The chair will be taken by Mr. E. J. Dobbs, B.Sc. Employers are asked to co-operate by allowing employees the necessary facilities to enable them to attend the meeting in good time. The subject matter before the meeting will be well worth the time of all members who attend.

A meeting of the London and South-Eastern Counties section of the **Institute of Chemistry** will take place at the Institute, 30 Russell Square, W.C.1, on **September 17,** at 4 p.m., when a lecture entitled "Nutritional Science and Dietary Practice" will be given by Mr. A. L. Bacharach, M.A., F.I.C.

The London Section of the **Oil & Colour Chemists' Association** is holding a lunch-time social, beginning at 1 p.m., on **September 20,** at Oddenino's Restaurant, Regent Street, London, W.

A three-day scientific conference, organised by the **British Association** (Division for Social and International Relations of Science) will be held at the Royal Institution, Albemarle Street, London, on **September 26, 27 and 28,** to "demonstrate the common purpose of men of science in ensuring a post-war order in which the maximum benefits of science will be secured for all people." Sessions will be presided over by the American, Soviet, and Chinese Ambassadors, by the President of Czechoslovakia, by Mr. H. G. Wells, and by Sir Richard Gregory, President of the British Association; and at the end Sir Richard Gregory will put forward a new charter of scientific fellowship. Poland, Norway, Holland, Belgium and France will likewise be represented, and exiled scientists from Germany, Austria and possibly Italy, will also take part.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

LEWIS BERGER AND SONS, LTD., London, E., paint manufacturers. (M., 13/9/41.) Aug. 23. £250,000 debentures; general charge. *Nil. Jan. 1, 1941.

KNOLL, LTD., London, W., manufacturing chemists. (M., 13/9/41.) Aug. 21. £10,000 debenture, to Savory and Moore, Ltd.; general charge. *Nil. Sept. 5, 1940.

WARD BLENKINSOP AND CO., LTD., Halewood, manufacturing chemists. (M., 13/9/41.) Aug. 18, series of £10,000 (not ex.) debentures, present issue £4500; general charge. *Nil. Oct. 17, 1940.

Satisfactions

MURPHY CHEMICAL CO., LTD., Wheathampstead. (M.S., 13/9/41.) Satisfaction Aug. 20, of debenture registered Dec. 11, 1931.

MIDLAND TAR DISTILLERS, LTD., Birmingham. (M.S., 13/9/41.) Satisfaction Aug. 23, of debenture stock registered Aug. 6, 1936, to the extent of £8500.

Winding Up Petition

CHEMICAL ENGINEERING AND WILTONS PATENT FURNACE CO., LTD. (W.U.P., 13/9/41.) Petition presented on Aug. 26, by Calvert and Co., Ltd., Hope Foundry, Rashcliffe Ironworks, Huddersfield; to be heard at the Royal Courts of Justice, London, on Oct. 20.

Receiver Ceasing to Act

UNIVERSAL EMULSIFIERS, LTD., London, E.C. (R.C.A., 13/9/41.) D. A. Clarke. Aug. 14.

Company News

The Ruberoid Co. has declared an interim dividend of 2 per cent. actual (same).

Tunnel Portland Cement, Ltd., is maintaining its interim at 7½ per cent. on the "A" and "B" ordinary stock.

Steaua Romana (Bucarest) announce a first and final dividend of 10 per cent. (7 per cent.) for 1940.

Oxley Engineering Co., Ltd., have declared a dividend of 12½ per cent. for the year ended June 30 (last year 10 per cent.)

The directors of **Boots Pure Drug Co., Ltd.,** have declared a dividend of 10 per cent., less tax, on the ordinary shares for the half-year to September 30 (last year 6 per cent. quarterly).

The Leeds Fireclay Co., Ltd., is paying no dividends for the year ended June 30 either on the preference shares (last year 4 per cent.) or the ordinary shares (same).

Imperial Smelting Corporation, Ltd., is paying a dividend of 3¼ per cent. on the 6½ per cent. cumulative preference shares, being balance of dividend for the year to June 30.

Beechams Pills, Ltd., have declared a first interim dividend of 7 per cent. on the deferred shares on account of the year ending March 31, 1942, payable September 30 (same).

Stewarts and Lloyds, Ltd., have declared interim dividends of 6 per cent. per annum on the cumulative first preference shares, 10 per cent. on the second preference shares, and 5 per cent. on the third preference shares, for the half-year to June 30, all of which are payable October 31.

New Companies Registered

Britarco, Ltd. (369,207).—Private company. Capital: £100 in 100 shares of £1 each. To acquire any property, patents and rights, and to carry on the business of refiners and smelters of and dealers in metals, alloys, residues, tailings and mineral substances, metallurgists, manufacturing chemists, etc. Subscribers: W. H. White; F. W. Yates. Registered office: 7 Gracechurch Street, E.C.3.

Synthetics (London), Ltd. (369,103).—Private company. Capital: £10,000 in £1 shares. Investigation and synthesis of chemical, biological, vegetable, and similar substances, and manufacturing, analytical and consulting chemists, manufacturers of and dealers in fertilisers, toilet preparations, etc. Subscribers: H. A. Mumford and Stephen Doewra, C.A. Registered office: 9 Arundel Street, W.C.2.

Chemical and Allied Stocks and Shares

SECURITY values have shown an upward trend in most sections of the Stock Exchange, where sentiment was assisted by developments in the war reported earlier in the week. Moreover, the recent speech of the Chancellor of the Exchequer had a very beneficial influence, particularly his statement that increased voluntary saving should remove the danger of inflation, and that fresh taxation may prove unnecessary this year. British Funds were also assisted by the view that an increase in interest rates is unlikely after the war, and also by market talk of the possibility of a new Government loan operation later in the year. Leading industrial securities have shown some response to the upward trend in market values, but this was attributed partly to absence of selling, the improvement in demand having been moderate at the time of writing. The declining fears of higher taxation in the immediate future have increased hopes that there may be little change in many of the important dividends that fall to be announced during the next few months. Moreover, it is widely recognised that, on the basis of last year's dividends, yields at current prices are still attractive in many instances.

Imperial Chemical at 31s. 9d. were little changed on balance; on the basis of last year's 8 per cent. dividend, the yield works out at fully 5 per cent., which compares favourably with that on many other leading industrial shares. Borax Consolidated, which have remained firm at 29s., yield approximately 5½ per cent., last year's dividend having been 7½ per cent. At their current price of 33s. 9d. Fison Packard shares yield 6 per cent. on last year's 10 per cent. dividend, but considerably smaller yields rule on numerous other shares. Associated Cement, for instance, yield less than 4 per cent.; last year's dividend was 10 per cent., while the price is 56s. 3d. In this case, however, the market is hopeful of an improved dividend for the current year, although no change is generally expected in the forthcoming interim dividend. B. Laporte have been firm at the higher level of 62s. 6d., at which the yield is approximately 4¾ per cent., last year's dividend having been 15 per cent. In other directions, Greeff-Chemicals Holdings 5s. ordinary units remained around par, and Monsanto Chemicals 5½ per cent. preference were again 22s. 6d. Pending publication of the results, business up to 7s. 9d. has been recorded in Lawes Chemical shares. Elsewhere, Valor ordinary have held their recent advance, and transferred at 32s. 6d., while Lacrinoid Products have also continued rather more active under the influence of the interim dividend, and changed hands up to 2s. Shares of glass and allied companies showed rather more dealings. Awaiting the dividend announcement, Triplex were around 22s. 6d., while elsewhere, United Glass Bottle were 53s. 9d. and Forster's Glass 10s. shares transferred up to 18s. 7½d.

Among other securities, firmness was again shown in United Molasses, which were 26s. 9d., and in Distillers ordinary units at 68s. 6d. Moreover, hopes of better results were reflected by further small gains in Imperial Smelting and General Refractories, which were 13s. and 11s. 4½d. respectively. British Oxygen remained firm at 67s., but at 47s. British Aluminium lost part of an earlier improvement. Barry and Staines held their recent rise to 36s., as did Nairn and Greenwich which were again 61s. 3d. There was a better tendency in iron and steel issues: Tube Investments remained firm at 94s. 6d., and Stewarts and Lloyds were higher at 47s. 6d., as were Guest Keen at 23s., while Babcock and Wilcox moved higher to 44s. 9d.

Lever and Unilever were firmer at 25s. 9d. and British Oil and Cake preferred ordinary improved to 40s. On the other hand, Boots Drug reacted to 34s. 3d., the interim dividend payment being below general market expectations. Elsewhere, Beechams Pills deferred were 9s. 7½d., Sangers 16s. 9d., and Timothy Whites 20s. 10½d. Burmah Oil, "Shell," and Anglo-Iranian were again better on balance; the improved tendency also extended to some of the smaller priced oil shares.